REMARKS

Claims 1-6 and 8-24 are all the claims pending in the application. Claims 1-6 and 8-19 are rejected. Claims 20-24 are withdrawn from consideration. Claims 1, 6, 13, 16 and 19 are amended. Claims 18 and 20-24 are cancelled. New claims 25 and 26 are added.

Support for Amendments

The amendment of claims 1 and 6 is clearly supported by the description of page 12, lines 19-26 of the original specification.

New claims 25 and 26 are clearly supported by the description of page 4, lines 15-17 and page 8, lines 20-24 of the original specification.

Claim Rejections - 35 USC § 103

Claims 1, 2, 4-6, 8, 9, and 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata (US 2002/0000424) in view of Kitano et al. (US 6,676,757). This rejection is traversed for at least the following reasons.

First, as to claim 18, the rejection is moot in view of the cancellation of the claim.

Amended Claims 1 and 6

Second, Claim 1 has been amended to further state that in the unnecessary film removing process, "a degree of vacuum in the reduced-pressure-drying process is controlled to suppress a flow of a resist from a central part of the substrate toward the periphery of the substrate by a temperature distribution and a centrifugal force in the unnecessary-film-removing process."

The present amendment reflects the discovery by the inventors that, when the unnecessary-film-removing process disclosed in Hata (corresponding to JP-A No. 2001-259502) is used, the covering member has a temperature distribution that the central part of the covering member has a relatively high temperature and the temperature decreases toward the periphery of the covering member. In addition, when the unnecessary-film-removing process is carried out during the rotation of the substrate, a flow of the resist is caused to occur under influence of the temperature distribution and the centrifugal force. This causes the local change in thickness to

deteriorate the in-plane-film-thickness uniformity (see page 3, line 20 to page 4, line 9 of the instant specification).

The present invention, as now recited in amended claim 1, is defined as *a method for manufacturing a mask blank by depositing a film of a resist liquid on a substrate including a thin film by a spin-coating process; covering the surface of the substrate with a covering member; and performing an unnecessary film removal process by dissolving of an unnecessary part of the resist film by supplying a solvent from above the covering member during the rotation of the substrate and the covering member together so that the solvent is supplied to the periphery of the substrate, wherein:*

the spin-coating process includes a spin-drying process for preliminary-drying the film of the resist liquid by rotating the substrate, and

a reduced-pressure-drying process for the resist film deposited in the spin-coating process is performed before the unnecessary-film-removing process for removing the unnecessary part of the resist film by dissolving so that a deterioration in an in-plane-film thickness uniformity of the resist film caused by the unnecessary-film-removing process is suppressed,

wherein a degree of vacuum in the reduced-pressure-drying process is controlled to suppress a flow of a resist from a central part of the substrate toward the periphery of the substrate by a temperature distribution and a centrifugal force in the unnecessary-film-removing process.

Amended Claim 6

Also, according to the present invention as recited in the amended claim 6, there is provided *a method for manufacturing a mask blank, comprising:*

depositing a resist liquid dropped on a substrate having a thin film by a spin-coating process;

forming a resist film by drying the deposited film of the resist liquid by a spin-drying process;

drying the resist film by a reduced-pressure-drying process;

supplying a solvent for dissolving the resist film to a periphery of the mask blank on which the resist film is formed; and

removing the resist film at the periphery by rotating the mask blank,

wherein a degree of vacuum in the reduced-pressure-drying process is controlled to suppress a flow of a resist from a central part of the substrate toward a periphery of the substrate by a temperature distribution and a centrifugal force in the removing of the resist film.

Controlled Degree of Vacuum Suppresses Undesired Resist Flow

Claims 1 and 6 now specify a main feature of the present invention as being "a degree of vacuum in the reduced-pressure-drying process is controlled to suppress a flow of a resist from a central part of the substrate toward a periphery of the substrate by a temperature distribution and a centrifugal force in the removing of the resist film".

By the main feature of the present invention, the present invention exhibits the remarkable effect that, even if the unnecessary-film-removing process using the covering member is carried out, it is possible to suppress the flow of the resist under the influence of temperature distribution and the centrifugal force and to improve the in-plane-film-thickness uniformity of the resist film.

The cited references fail to disclose or suggest the main feature of the present invention and the remarkable effect of the present invention, as described below in detail.

Hata

Hata discloses a method of dissolving an unnecessary part of the resist film through a solvent supply hole and removing the unnecessary part while the substrate and the covering member are rotated together. As admitted by the Examiner, Hata neither discloses nor suggests the reduced-pressure drying process in this invention.

Kitano

Kitano addresses the problem that, when the resist solution is applied to the substrate by spin coating, in-plane-film-thickness uniformity is deteriorated in case where the thickness is

small, and aims to provide an apparatus capable of realizing a technique which supersedes the above-mentioned conventional technique.

Disclosure of Vacuum Parameters and Control is Limited

Kitano describes that the reduced-pressure drying process is carried out after applying the resist solution. However, Kitano merely describes that the degree of vacuum during the reduced-pressure drying process is 13.3Pa (column 12, line 4). Kitano neither discloses nor suggests that the degree of vacuum during the reduced-pressure drying process is controlled so as to suppress the flow of the resist from the center toward the periphery of the substrate, which is caused due to the temperature distribution and the centrifugal force in the unnecessary-film removing process.

Reduced Pressure Drying Process Differs in Timing and Effect

In the reduced-pressure drying process of Kitano, the degree of vacuum is controlled so that the solvent in the resist solution is vigorously volatilized, whereby the surface of the wafer can be dried in a short time (column 12, lines 4-7). By contrast, according to the present invention, the degree of vacuum is controlled considering the flow of the resist occurring in the subsequent process. Thus, the control of the degree of vacuum is quite different between Kitano and the present invention.

Furthermore, in Kitano, in the unnecessary film removing process as a process after the reduced-pressure drying process, the peripheral portion of the resist is removed by using the surrounding member 21 surrounding the peripheral portion and the solvent nozzles 22 and by moving the surrounding member 21. Therefore, the concept (the main feature) of the present invention is not conceivable from Kitano, i.e., to control the degree of vacuum in the reduced-pressure drying process, considering that the flow of the resist is caused due to the temperature distribution and the centrifugal force in the unnecessary-film removing process in which the covering member is used and the substrate is rotated.

Combined Teachings of References Do Not Lead to Claimed Invention

Examiner considers that the present invention could be obtained by combining Hata and Kitano because a similar material and a similar process are disclosed. However, even with a

similar material and a similar process, neither of these references recognizes the problem about occurrence of the flow of the resist due to the temperature distribution and the centrifugal force in the unnecessary-film removing process in which the covering member is used and the substrate is rotated. Therefore, one skilled in the art would not find it obvious to control, among various parameters, the degree of vacuum during the reduced-pressure drying process as described above.

Applicants respectfully submit that the cited references fail to disclose or suggest the main feature of the present invention and the remarkable effect of the present invention. Accordingly, the present invention, as now defined by independent claims 1 and 6, is clearly patentable over the cited references.

Claims 2, 4-6, 8, 9, and 11-17

These claims would be patentable at least because of their dependence from one or both of amended claims 1 and 6.

Claims 3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata in view of Kitano et al. as applied to claims 1 and 6 above, and further in view of Okada (US4,748,053). This rejection is traversed for at least the following reasons.

In framing the rejection, the Examiner admits that Hata in view of Kitano et al. "lack a teaching of first applying the resist liquid at a first speed, and then spinning at a second, lower speed in the spin coating process." The Examiner looks to Okada for a teaching that "a uniform film is achieved on the square substrate when spreading of the resist occurs by rotating at a first speed, followed by drying during the spreading step by rotating the substrate at a second speed slower than the first speed (abstract and col. 2, lines 11-26)."

Okada

Okada is cited solely for performing spin coating/drying process at two separate speeds, a first higher speed followed by a second lower speed, and does not remedy the deficiencies of Hata in view of Kitano et al., as noted previously. Accordingly, claim 1 as amended would be patentable over the combination of three references and claims 3 and 10 would be patentable at

least for the same reasons because of their dependency from amended claims 1 and 6, respectively.

New Claims

Each of the new claims 25 and 26 has the feature of controlling a degree of vacuum in the reduced-pressure-drying process is controlled to suppress a flow of a resist from a central part of the substrate toward the periphery of the substrate by a temperature distribution and a centrifugal force in the removing of the resist. This feature, expressed slightly differently in each claim, is not found in the cited prior art.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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Date: February 28, 2011